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MARELITT BALTIC: *reducing the impact of DFG*

Derelict Fishing Gear: problem statement

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Presentation outline

- What is Derelict Fishing Gear (DFG)?
- The extent of the DFG problem.
- Existing DFG policies.
- Causes of DFG: direct and indirect.
- Impact of DFG: environmental, health & safety, economic.
- Measures to address DFG: prevention, mitigation, remediation.
- Conclusions.

What is DFG ?

- Marine litter is any material:
 - deliberately discarded into the sea or rivers or on beaches;
 - brought indirectly to the sea with rivers, sewage, storm water or winds;
 - or accidentally lost, including material lost at sea in bad weather.
- predominantly plastics (+80%), but also wood, metal, glass, rubber, clothing and other materials.

What is DFG ?

- Sources of marine litter:
 - Sea: mainly merchant shipping, recreational boating, fishing, oil rigs....
 - DFG from recreational fishing is significant problem in countries where this activity is popular, but is not covered by the project (because of different stakeholders, requiring different measures).
 - Land (e.g. municipal waste).
- Some common marine litter items include:
 - Food- and beverage related waste (e.g. bottles, disposable cups, bags)
 - Smoking related waste (disposable lighters, filters, cigar tips)
 - Manufacturing and transport related waste (resin pellets, pallets, plastic sheeting and straps)
 - **Derelict fishing gear** (DFG): abandoned, lost or otherwise discarded fishing gear
 - estimated by some at 10% of global ML by volume;
 - widely considered to be one of the most problematic ML items.
- **Major types of gear** that contribute probably the most the overall impacts of DFG: trawls, gillnets, traps, and line fisheries

Distribution of DFG

- **Overall distribution of ML:**
 - up to 70%, ends up on the seabed.
 - 15 % floats on the surface.
 - 15% washes up on the coasts.
- **Distribution of DFG:**
 - Trawls
 - Derelict trawl webbing and cod ends from trawl nets (with synthetic sections that are buoyant) are found on shores up to thousands of miles from their origins.
 - Steel cables, doors, beams, and other materials (used to maintain the vertical and horizontal profiles of the trawl) make that the trawl as a whole is negatively buoyant.
 - The increased strength of synthetic webbing reduces hydrodynamic drag and enables vessels to pull larger nets at greater depths (and at higher speeds).
 - Derelict gillnets: found on beaches, reefs, and adrift at sea.
- DFG related litter tends to accumulate and often resides for extended time periods in ocean convergence zones.

DFG quantities

- Total volume of new ML each year is estimated at 10 mio tonnes.
- Overall quantities of ML are increasing, due to:
 - continuously growing quantity of litter.
 - and very slow rate of degradation of most ML items, incl. DFG
 - plastic never biodegrades (e.g. microbes typically cannot utilize carbon in plastics to create CO₂) , but only physically degrades through solar radiation into ever and ever smaller pieces (micro-plastics)
- The oceans are the world's biggest landfill.



The extent of the DFG problem

- Estimated rate of permanent net loss: <1% of nets deployed.
 - the potential loss of nets is greater in deeper than in shallow waters; also because it is easier to retrieve the nets
 - The Baltic sea with an average depth of 50 metres, which is relatively low compared with the Mediterranean's 1500 metres.
- Quantities of new DFG are decreasing, due to:
 - FG loss rates are declining, due to among other:
 - Use of GPS equipment that allows the positioning of hooks (prevention) and of DFG (facilitating retrieval).
 - Increasing prices of fishing gear, which fishermen cannot afford to lose.
 - Improved fishing techniques and gear.
 - Ever decreasing fishing sector: landings (value as well as quantity), vessel numbers and numbers of fishermen are all decreasing.

The extent of the DFG problem

- BUT the FG waste streams comprises:
 1. not only DFG that is retrieved from the marine environment
 2. but also nonoperational gear (used gear) i.e. damaged, old or retired gear.
- Vast amounts of nonoperational FG accumulates in storage yards, due to:
 - Fishing restrictions: because of the selectivity, FG with certain mesh sizes may not be used anymore.
 - Reduction of overall size and capacity (power and tonnage) of the European fishing fleets, with fishermen leaving the industry.
 - High recycling potential due to quantities and homogenous composition of this waste stream.
- Possible measures:
 - Provision opportunities for commercial fishermen to dispose of all FG waste at low to no cost.
 - e.g. collection through a network of bins in port areas.
 - subsequent recycling of the metals and incineration with energy recovery of the plastic.
 - nonoperational gear + retrieved DFG
 - may enhance recycling opportunities, as having a large, stable supply of recyclable material is crucial for a recycling program to work.

The extent of the DFG problem

- Management of the FG waste stream is a challenge, because of:
 - the quantity
 - the composition:.
- Historically, FG was made of natural fibers (hemp, cotton, jute, sisal, manila, silk, and linen), with durability and strenght limitations:
 - required treatment with a wide variety of dyes, tars, and preservatives to retard their rate of degradation in the marine environment.
 - environmental impact
 - high failure, replacement, and repair rates.
- Currently, FG is made of cheap, durable, and lightweight synthetic (e.g. polyethylene) ropes.
 - contributed to the vast growth in fish harvesting capacity.
- Synthetic FG is problematic:
 - Durable: does not biodegrade and can last forever in the marine environment.
 - Buoyant : can be transported long distances by currents.



Existing DFG policies

- DFG received until now less attention than other ML items.
- However various international legal & policy regimes recognise the issue.
 - but poor implementation and enforcement
 - specific DFG policies and abatement plans at EU or national level are still missing.
- DFG is inherently an international/regional problem:
 - DFG persists, can be transported long distances and knows no borders.
 - fishermen are active in various waters.
 - parties that generate DFG may not be the ones that bear the effects of it.



Existing DFG policies

- **United Nations:**
 - UN GA Resolution on sustainable fisheries: encourages States to take action to reduce DFG.
 - Rio +20 commitment to take action to achieve significant reductions in marine debris and to achieve the goals of the Honolulu strategy (A/RES/66/288, 2012).
 - Revised Annex V of MARPOL 73/78.
- **HELCOM:**
 - Baltic Sea Action Plan (2007) encouraged Contracting Parties to raise awareness on DFG impacts.
 - Regional Action Plan on ML: by 2015.



Existing DFG policies

- **European Union:**

- The EU Marine Strategy Framework Directive (MSFD, 2008/56/EC): the framework within which EU Member States must act to achieve or maintain good environmental status (GES) of their marine waters by 2020.
 - GES is based on 11 qualitative descriptors (in Annex I) . Descriptor 10 concerns ML.
- The Control Regulation (EU) N° 1224/2009 contains provisions on retrieval and reporting of lost fishing gear.
- Regulation (EU) N° 404/2011 include among other gearmarking rules, that aim to contribute to avoiding navigational hazards to other maritime users, help to prevent conflicts between towed and passive gear, and entanglement or damage of gear of other fishermen
- Council Regulation (EC) No 1005/2008 defines an EU system to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing.
 - Commission Regulation (EC) No 1010/2009 lays down its implementation.
- EC’s communication “Towards a circular economy”: to reduce by 30% by 2020 FG found at sea”.

Causes of DFG

- Some degree of DFG is unavoidable due to:
 - environmental conditions (e.g. weather, currents, tides, sea state, presence of sea ice, the makeup of the seabed);
 - the condition of the gear, equipment, and vessel;
 - a range of economic pressures and regulatory factors.
- The causes and loss rates of DFG vary between and within fisheries, due to:
 - different types of gear,
 - different environment conditions etc.
- Some DFG may be intentional (abandoned) and some unintentional (lost).
 - correspondingly, the measures for reducing DFG need to be diverse.

Direct causes of DFG

- **Accidental loss**, when nets are snagged on rock, coral or wrecks or break when attempting to retrieve them.
- **High cost of FG retrieval**
- **Cost of DFG retrieval**: relatively high cost, due to lost active fishing time, compared to the cost of buying new gear (in particular in the past).
- **Spatial pressure, resulting in gear conflicts** between:
 - static and towed gears, when trawlers tow through set-nets (resulting in net loss or damage).
 - gillnet fishing fleet and merchant fleet (merchant vessels run over a net markers/flags, consequently tow/move the fleets or cut the rope from marker to gillnets).

Direct causes of DFG

- **At-sea disposal of unwanted gear**, including waste resulting from repair work during fishing trips.
- **Cheaper, low-quality gear**:
 - less durable FG.
 - easier snagged.
 - lower financial motivation to retrieve.
- **Adverse weather conditions**, making it more likely that FG will be left of discarded.



Direct causes of DFG

- **Theft and vandalism**
- **Enforcement pressure:** those that practice illegal, unregulated and unreported (IUU) fishing (e.g. use of high seas drift gillnets), may abandon gear in an effort to evade enforcement vessels.
- **Loss of floating or drift gillnets** when:
 - marker buoys are lost in foul weather or are entangled or carried away by vessels that transit through them
 - the weight of their catch causes them to sink.

Indirect causes of DFG

- **Port reception facilities:**
 - Not available in all fishing ports.
 - Inadequate.
 - Restricted accessibility.
 - Not providing for DFG
 - Cost of using: some ports in some countries have a “no-special-fee system”, but not in all (e.g. not in Poland)
 - may encourage dumping of unwanted FG at sea rather than disposal onshore.

Impact of DFG: environmental

- **Toxic chemicals** in the marine environment: ultimately all non-retrieved DFG, ends up as micro-plastics = a potential source of toxic chemicals.
 - the impact of micro-plastics is not yet fully known.
- **Hazardous materials:** the foot rope of set nets may be weighted by leadline (zinc may also be used).
- **Toxic air emissions:** from the inappropriate disposal of some of the retrieved DFG or unused/damaged gear, such as open air burning.

Impact of DFG: environmental

- **“Ghost fishing”**: continued catching of species.
 - largely confined to passive gears (gillnets, pots/traps etc.)
 - catching efficiency declines once FG has been lost
 - because many static-net fisheries take place in shallow water, where:
 - storm and tide action can quickly roll up the nets
 - the rate of bio-fouling (making nets more visible and making them lose their vertical profile), which reduces catching efficiency, is relatively high.
- **Ingestion** of gear-related litter by marine wildlife.
- **Entanglement** in DFG and other plastic litter by marine wildlife (e.g. sea turtles, marine mammals and sea birds).

Impact of DFG: environmental

- **Alterations to the benthic environment:**
 - Gillnets may be dragged along the bottom, by strong currents and wind during retrieval, potentially harming plant life, fragile organisms - like sponges and corals- and substrate habitats.
 - Derelict traps may have physical impacts, in particular on sensitive bottom habitats such as sea grass beds or areas where emergent fauna such as corals and sponges occur.
- **Introduction of alien species:** DFG is a pathway to bring harmful species to a new habitat.
 - Invasive species may wipe out native species.
 - Less important for the Baltic Sea, which is a semi-closed sea with only a small link to the North Sea, and, ultimately, the Atlantic Ocean, through the Kattegat and Skagerrak Straits.

Impact of DFG



Impact of DFG: health & safety

- **Health risks:**
 - Swimmers & divers: degradation of bathing water quality.
 - Introduction of synthetic material and toxic chemicals into the (marine) food chain.
- **Safety risks:**
 - Swimmers & divers: can become entangled in DFG.
 - Mariners: navigational hazard, through entanglement of propellers in DFG.

Impact of DFG: economic

Fishing sector:

- **High cost of fishing gear:** a fisherman cannot afford to lose nets.
- **Lost operating time:** due to propellers entangled in DFG;
- **Stock reduction:** resulting from contamination of catches and “ghost fishing”.
- **Physical damage:** to fishing vessels and to nets;
- **Negative reputation:** of the fishing sector and consumer concern.

Impact of DFG: economic

- **Local authorities:** cost to clean-up shores & ports.
- **Port authorities:** cost to clean-up ports
- **Tourism sector:**
 - Aesthetic impact of DFG-related litter on beaches reduce visits and related revenue.
 - DFG impedes the booming recreational fishing business, if recreational fishing gear gets lost when entangled or hooked.
 - Heavily littered underwater sites are avoided by divers.
- **Coastal communities:** depending for their livelihood on fishing & tourism, are directly impacted.

Measures to address DFG

- Measures can broadly be divided in 3 categories:
 - **prevention** (avoid the occurrence of DFG in the environment);
 - **mitigation** (reduce the impact of DFG in the environment)
 - and **remediation** (remove DFG from the environment).
- **Types of policy measures:**
 - Some measures may need to be supported by a **legal** requirement,
 - While other measures may be just as effective if introduced on a **voluntary** basis and when **economic** incentives are provided.
 - possible inclusion of measures in responsible fisheries schemes.
 - **Raising awareness** is a cross-cutting measure to help the development and implementation of any measure.
- **Prioritisation of measures ?**
 - Often, remediation gets more attention from policy makers and other stakeholders.
 - While the most effective way to tackle DFG is prevention, as its avoids its occurrence
 - BUT: a mix of the 3 categories and types of measures needed to successfully reduce the DFG problem.

Measures to address DFG

- **Financing of measures:** measures should aim to make the polluter pay.
 - However, the costs associated with DFG are currently largely borne by society, but not by those causing the problem.
 - It is difficult to identify responsibilities and to assign liabilities.
 - Under a “polluter pays” principle, the fishing industry could collectively take responsibility for the full range of their impacts on the environment, including the fate of lost gear.
 - Initially government funding is required to help addressing the DFG issue, but making other stakeholders pay should be the mid-term objective.
- **Information gaps:** a lack of systematic, scientific knowledge on the amounts, sources, fates, trends and impacts of DFG, due to limited systematic regional measurements.
 - an obstacle to better management, but enough is known to undertake immediate action.

Measures to address DFG: a complex policy environment

- DFG issues touch upon **various policy domains**.
 - measures to tackle DFG must cross government departments and funding infrastructures. (fisheries, economy, environment, health,...)
- DFG is inherently a **regional problem**.
 - global & regional strategies, to be implemented at national & local level, are needed.
- **Fisheries sector is very diverse**.
- **Causes and extent** of net loss & abandonment vary between and within fisheries.
 - a detailed understanding is required to design effective measures, tailored to particular locations and fisheries
- **A wide range of stakeholders** that should apply DFG measures or should change their behaviour.
 - such as Fishermen; Port authorities; Policy makers; Gear manufacturers.



Preventive measures to address DFG

- **DFG reduction plans**, that integrate all measures
 - with supporting legislation and economic incentives for changing behaviour.
- **Deposit-refund schemes** for fishing gear:
 - to encourage the return of DFG to the manufacturer for recycling.
- **Extended Producer Responsibility**
 - to ensure design for the environment of FG & collection and recycling of DFG.
- **Spatial management (e.g. zoning schemes):**
 - a tool to address conflicts among user groups (either between different fishing groups or between fisheries and other maritime sectors).

Preventive measures to address DFG

- **Vessel permits and professional fishing licenses:** could incorporate DFG related obligations and requirements (e.g. related to use of certain gear, DFG retrieval).
- **Certified manifest of fishing gear:** requirement to carry a manifest onboard at the beginning of a trip
 - to allow port states to inspect for compliance with MARPOL Annex V and refer violations for flag state enforcement.
- **Increased effectiveness of port State measures** in tackling illegal, unreported and unregulated (IUU) fishing.

Preventive measures to address DFG

- **Onboard technology** to avoid “hooks” (and subsequent net loss) and to improve the location (e.g. radar, sonar) of lost gear.
- **Reporting** by fishermen and divers (both professional and recreational) of type and location of lost gear.
 - to facilitate retrieval.
 - requires improved enforcement of EU Regulation 1224/2009 provisions on reporting lost gear.
- **Mapping** and database of “hooks” (rock, coral, lost cargo, wrecks from World War I & II, pipelines etc.).
- **Information systems** for exchanging information between fishing vessel operators using untended, fixed or drifting gear with other ship traffic as may be necessary
 - to minimize accidental encounters between ships and gear.

Preventive measures to address DFG

- **Port reception facilities:** provision of adequate, affordable, accessible facilities.
 - a certification system for reception facilities, with the actual ability to receive used fishing gear and DFG as one of the minimum assessment criteria ?
- **Effort reduction measures to limit:**
 - the amount of gear that can be used (e.g. pot/trap limits)
 - soak-time (the amount of time gear can remain in the water)
 - These measures may reduce operational losses, but are difficult to control and to enforce.
- **Raising awareness & education:** to facilitate a change in behaviour by stakeholders.

Mitigation measures: to reduce impact of DFG

- Return to biodegradable netting: very limited so far due the comparative economic advantages of synthetic over natural fibers: durable, resistant to being torn, lighter, no need to be treated.
- Design of benthic traps, trawl and gillnets to have degradable panels or sections (made of natural fiber twine, wood or wire)
 - to reduce the potential of entanglement and “ghost fishing”.
- Stronger, lighter netting (e.g. made of high-performance polyethylene) is less likely to tear apart when snagged or heavily loaded during fishing. These nets may still be relatively expensive.
- Improvement of the ability to locate DFG using acoustic echo-sounding, by producing nets with fibres to which substances are added (such as barium sulphate) which increase acoustic reflectivity.
- Improved gear marking: to identify ownership and to facilitate reporting, retrieval and return of lost gear.
 - Enforcement of EU Regulation 404/2011 provisions on gear marking should be improved.
- To enhance acceptance of measures, manufacturers should avoid that changes to gear, equipment and methods increase costs, due to:
 - reduced effectiveness of FG.
 - higher prices of FG.

Remedial measures

- Avoiding DFG in the first instance will be the most effective.
- BUT retrieval can be cost-effective when considering the costs of leaving the DFG the marine environment.
- A DFG retrieval programme includes the following (broadly) sequential measures:
 - Identification of DFG accumulation areas:
 - efforts to locate lost gear, using various technologies (e.g. side scan sonar for sea-bed surveys;
 - the introduction of systems to report lost gear;
 - Prioritisation of the areas/wrecks from which DFG will be removed (using a set of criteria: ecological, efficiency, effectiveness etc...)
 - Gear removal;
 - Appropriate disposal; preferably recycling of DFG material.
 - open air burning should be absolutely avoided.



Remedial measures

- Adequate and affordable disposal of fishing gear is a challenge:
 - the gear is often very bulky
 - fishing vessels may operate in remote and less populated areas with limited waste management capacity
 - Recycling potential exists, in particular if also the vast quantities of nonoperational FG are collected, which may result in the necessary critical quantities.
- A limited number of existing recycling facilities in the EU.

DFG retrieval during regular fishing ?

- **Scope:** trawlers could clean fishing grounds during regular fishing, by:
 - limited dragging in areas with a high accumulation of DFG
 - not cutting loose DFG on which their gear is hooked (hooks will be minor given that trawling is in principle in areas without a rocky sea bottom) and by landing it.
- **Existing incentives:**
 - Without much extra effort, fishermen reduce the ghost fishing phenomenon
 - Some of the retrieved nets may still have economic value
- additional incentives may be needed to encourage fishermen to retrieve DFG encountered on the fishing grounds.
- **Advantage:** an efficient manner of DFG retrieval, given that several costs (e.g. fuel, staff time) related to dedicated retrieval trips, are avoided

DFG retrieval during regular fishing: challenges

- Legal:
 - fishery regulations prohibit vessels from carrying gear that is not a gear type permitted under their license endorsement;
 - Retrieved DFG can mostly be distinguished from the fisher's own FG, but it is nevertheless recommended to record the retrieval in the log book, that can be shown upon inspection;
 - DFG may be considered personal property or may constitute a violation of regulations, and can only be removed by the owner or an enforcement officer.
 - Retrieval may require permits (e.g. to take protected species from their habitats) and/or preliminary impact assessments.



DFG retrieval during regular fishing: challenges

- Hygienic and sanitary constraints: DFG may be hazardous waste and contact with catch should be avoided.
- Practical: lack of space on smaller vessels to store bulky DFG separate from the catch.
- Economic:
 - Retrieving DFG is time-consuming.
 - High disposal costs, for which the fisherman that retrieved DFG may be held liable, and limited recycling and final disposal options, in particular if the fishing port is a small operation in a remote area.
- Safety



Conclusions

- DFG is a serious global and EU marine environmental problem, causing ecological, health & safety and economic impacts.
- A complex problem: a wide diversity of causes and impacts, and of stakeholders that should take measures or change their behaviour.
- The lack of exact knowledge on some DFG aspects should not be taken as a reason for inaction
 - a wide range of measures can be undertaken immediately at relatively low cost.

Conclusions

- Large potential for improvement of DFG management in the EU's 4 regional seas: prevention, mitigation and remediation
- Concerted regional efforts, involving all stakeholders, are needed to begin to address the problem.
- MARELITT Baltic can contribute to the solution in the Baltic & set an example for the other regional seas.